

Applicant(s): Vierheilig  
 Application No.: 10/749,965

Docket No.: 113222.146 US1

name of 'precursor'; however, the compound which Stamires calls a precursor is not same precursor as applicant's (as demonstrated by various characteristics such as XRD, etc.)

- Applicant's "precursor", also referred as mixed metal oxide compound, is not and cannot be the same composition as a "hydrotalcite like compound", calcined HTL, slurries and Stamires' so called precursor based on multiple differing characteristics such as XRD pattern (and ASTM and ABD, degree of gasoline sulfur reduction, product yield, and yield shift.) Each characteristic independently shows that the precursor is not and cannot be the same composition as an HTL or calcined HTL.
- '023 reference Fig 5 shows that applicant's mixed metal oxide has an x-ray diffraction pattern that differ from an HTL, slurries or the so called 'precursor' of Stamires. Hence, this mixed metal oxide is not the same compositions as HTL, slurries, or Stamires' so called precursor.. Fig 5 of '023 reference shows that the 3<sup>rd</sup> graph from top labeled 'heat treated' is the x-ray diffraction pattern of the mixed metal oxide while the 4<sup>th</sup> graph labeled "heat treat+hydrate (activated HTL)" is the resulting HTL structure, wherein the 3<sup>rd</sup> and 4<sup>th</sup> graphs are not the same.

Independent claims have the phrase 'X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees' to define and distinguish this mixed metal oxide from an HTL (graph 4) or other XRD graphs of slurry (graphs 1 and 2), and Stamires' so called precursor.

Thus, reducing gasoline sulfur emissions from a FCC unit or cracking unit with a mixed metal oxide compound is not and cannot be inherent or obvious because HTL, calcined HTL, or slurries are different from a mixed metal oxide (as discussed) and '023 does not disclose using a mixed metal oxide for such uses and hence the mixed metal oxide is not and cannot be in the FCC unit to necessarily, inherently or obviously reduce gasoline sulfur. In other words, reducing gasoline sulfur emissions from an FCC unit or cracking unit with a mixed metal oxide is not and cannot be inherent when the mixed metal oxide is not in the FCC unit or cracking unit and when the references do not suggest using the mixed metal oxide or as in Stamires, does not even disclose the mixed metal oxide. Thus, a new method for reducing gasoline sulfur with a mixed metal oxide is not inherent or obvious over '023 alone or in view of Stamires and is patentable because new method or use of a compound is patentable.

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57. (original) A method of reducing the concentration of sulfur in gasoline produced in an FCC unit comprising:

contacting a catalytic cracking feedstock with an effective amount of one or more mixed metal oxide compounds prepared by a process comprising:

- (a) reacting an aqueous mixture comprising at least one divalent metal compound and at least one trivalent metal compound to produce a mixed metal oxide compound in the form of an aqueous slurry;
- (b) optionally heat treating the mixed metal oxide compound from step (a) at a temperature up to about 225°C to produce a heat-treated mixed metal oxide compound in the form of an aqueous slurry;
- (c) drying the heat-treated compound from step (b) to produce one or more shaped bodies of the mixed metal oxide compound suitable for use in the reduction of sulfur from gasoline; and
- (d) optionally heat treating the shaped bodies from step (c) at a temperature of about 300°C or higher to produce one or more calcined shaped bodies of a mixed metal oxide compound; wherein the one or more mixed metal oxide compounds has an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees.

77. (original) A method of reducing the concentration of sulfur in gasoline produced in an FCC unit comprising contacting a catalytic cracking feedstock with an effective amount of at least one mixed metal oxide compound comprising magnesium and aluminum in a ratio of about 1:1 to about 10:1 and having an x-ray diffraction pattern displaying at least a reflection at a two theta.

100. (original) A method for reducing the concentration of sulfur in gasoline produced in an FCC unit comprising contacting a catalytic cracking feedstock with

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- (i) an effective amount of shaped bodies comprising a mixed metal oxide solid solution comprising magnesium and aluminum in a ratio of about 1:1 to about 10:1 and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees,
- (ii) a support comprising a spinel, magnesia, magnesium acetate, magnesium nitrate, magnesium chloride, magnesium hydroxide, magnesium carbonate, magnesium formate, magnesium aluminate, hydrous magnesium silicate, magnesium silicate, magnesium calcium silicate, aluminum silicate, calcium silicate, alumina, aluminum titanate, zinc titanate, aluminum zirconate, calcium oxide, calcium aluminate, aluminum nitrohydrate, an aluminum hydroxide compounds, an aluminum-containing metal oxide compound other than alumina or an aluminum hydroxide compound, aluminum chlorohydrate, silica, silicon-containing compound other than silica, silica/alumina, titania, zirconia, clay, clay phosphate material, zeolite, or a mixture of two or more thereof; and
- (iii) at least one metallic oxidant selected from antimony, bismuth, cadmium, cerium, chromium, cobalt, copper, dysprosium, erbium, europium, gadolinium, germanium, gold, holmium, iridium, iron, lanthanum, lead, manganese, molybdenum, neodymium, nickel, niobium, osmium, palladium, platinum, praseodymium, promethium, rhenium, rhodium, ruthenium, samarium, scandium, selenium, silicon, silver, sulfur, tantalum, tellurium, terbium, tin, titanium, tungsten, thulium, vanadium, ytterbium, yttrium, zinc, or a mixture of two or more thereof.

104. (original) A method for reducing gasoline sulfur comprising contacting a catalytic cracking feedstock with (i) a mixed metal oxide compound comprising magnesium and aluminum and having an X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees, wherein the ratio of magnesium to aluminum in the compound is from about 1:1 to about 10:1, and (ii) about 1 wt% to about 75 wt% of a hydrotalcite like compound.

114. (original) The method according to claim 113, wherein the compound comprises (i) about 99 wt% to about 75 wt% of a compound comprising magnesium and aluminum and having an

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**X-ray diffraction pattern displaying at least a reflection at a two theta peak position at about 43 degrees and about 62 degrees, wherein the ratio of magnesium to aluminum in the compound is from about 1:1 to about 6:1, and (ii) about 1 wt% to about 25 wt% of a hydrotalcite like compound.**